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ABSTRACT

This paper briefly describes two interactive multimedia research and development projects, the Palenque Project (1985-1991) at Bank Street College, and the Museum Education Consortium's Interactive Video Project (1988-1991) at the Museum of Modern Art in New York City. It is noted that the designs of both prototypes share experimentation with a pedagogical bias toward discovery-based learning, feature exploratory experiences in multidimensional environments, and contain a variety of similar user interface characteristics which promote information access and manipulation. Each of the projects is described separately. Palenque is a digital video interactive (DVI) project based on a self-directed exploration of an ancient Maya site and on the perusal of a multimedia database called the Palenque Museum, which was originally designed to provide a discovery-based experience for 8- to 14-year-old children and their families at home. The Museum Consortium's project is an interactive multimedia prototype that was developed as a discovery-based learning experience for testing with adult museum visitors who have a limited knowledge of art history or art. Design features common to the two projects are then discussed, and a brief summary of the design issues that need to be addressed in their development concludes the paper. (ALF)

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Two Multimedia Design Research Projects: *Palenque* and *The Museum Visitor's Project*

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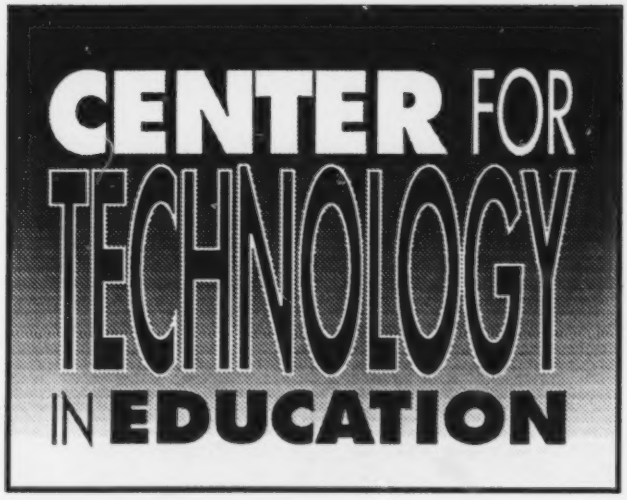

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TWO MULTIMEDIA DESIGN RESEARCH PROJECTS: *Palenque* and *The Museum Visitor's Prototype*

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This paper briefly describes two multimedia research and development projects: (1) the Palenque Project (1985-1991) at Bank Street College in New York City; and (2) the Museum Education Consortium's Interactive Video Project (1988-1991) at the Museum of Modern Art in New York City. The two interactive multimedia prototypes developed for each of these projects are discussed together here because the design of both involved experimentation with a pedagogical bias toward discovery-based learning, as well as with a variety of similar user interface characteristics, although each was designed with unique content, target audiences, learning contexts, and hardware systems in mind.

OVERVIEW

The design and development of interactive multimedia applications is a complex and challenging process, which is still evolving as the hardware, software, creative talent, production services, publishers, and target markets are all evolving at the same time. Compared with other media, such as print, film, radio, or TV, interactive multimedia as a medium that combines many media and makes use of them interactively is still relatively new—at best, fifteen years old. The design and development process is far from standardized, although effective design formats and templates have begun to emerge in certain sectors, such as for corporate and military training. Technical advances continue at such a rapid pace that even experienced designers have been kept on a steep learning curve for over a decade. Many issues of how best to use interactive multimedia—why, when, for whom, and where—are still being explored. The two projects described in this paper, Palenque and the Museum Visitor's Prototype, are both examples of research and development efforts that have attempted to address some of these questions. They are discussed together here because they share a discovery-based orientation and certain accompanying user-interface design characteristics, although they also vary in many significant ways, such as in content, hardware used, target audience, and target context.

The Palenque prototype, first developed in 1985, in many ways instantiates the Bank Street School for

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Children's pedagogical bias toward discovery-based learning. This approach is evidenced throughout Bank Street College, in both its nonelectronic and electronic learning environments, methods, and materials. The basic characteristics of this approach include student-centered learning; exploration and inquiry; direct experience and "real-world" connections; interaction (child with child, child with teacher, child with materials, child with the world outside the classroom); critical analysis and meaningful action ("learning by doing"); deep engagement with learning tasks; reflection, collaboration, and interdisciplinary work. The teacher's, and/or designer's, role is central in orchestrating the discovery-based learning process by doing such things as designing the structure of the learning environment, sequencing the introduction of materials and activities, starting where each child is in his or her understanding, and guiding students in their inquiries (Bruner, 1961; Dewey, 1938; Mitchell, 1934).

In 1987, the Palenque prototype was shown to several focus groups, including teachers, corporate trainers, university researchers, and museum professionals. Of particular interest were the reactions from museum professionals, who felt that the "intellectual space" in Palenque and the way it is probed via open investigation meshed extremely well with the idea of encouraging open-ended exploration in a typical museum exhibit. They commented on the importance in Palenque of different options for different users and uses, and of having a variety of difficulty and interest levels. Many members of the Museum Education Consortium were involved in this focus-group testing and decided, after seeing Palenque, that they would like to try to develop a prototype for museum visitors with the discovery-based philosophy and interface characteristics inherent in the Palenque design, as part of their interactive video research and development project .

THE PALENQUE PROJECT

Palenque is a Digital Video Interactive (DVI) multimedia application that was developed originally at Bank Street College as a collaborative research and development project with RCA/GE's David Sarnoff Research Center and Peace River Films from 1985 to 1987. Three versions of Palenque have been made to date: (1) the original Palenque (1985-1987), which was an extensive prototype designed as a consumer application for use by 8- to 14-year-old children and their families at home; (2) a DVI product demo (1987), the Palenque "sliver," which was designed for use by GE (and later Intel) since 1987 for marketing DVI technology; and (3) a Palenque museum product (1990-1991), based largely on the original prototype for children, which has been under development at Bank Street with funding from Sunburst Communications/Wings for Learning. In-depth observational research was conducted at Bank Street in 1987-1988, with children using Palenque to get a better idea of their navigational strategies for using it, what they learned from using it, and how they understood its structure and complex connectivity (Wilson, 1988).

The design of Palenque was influenced by several other projects. For example, it incorporates some of the themes, locations, and characters from *The Second Voyage of the Mimi* television show, which was produced at Bank Street College as part of the Project in Science and Math Education. The *Mimi* project can be described as "multimedia" to the extent that it includes a thematically, but not electronically, integrated package of video, computer software, and print materials. These materials are designed to introduce science concepts to 8- to 14-year-old children in a motivating and "real-world" way. The "science" of the *Mimi* is archeology, and the location is the Yucatan peninsula in Mexico (Gibbon, 1983). Another major influence on the design of Palenque was the surrogate travel concept developed at MIT's Architecture Group in the late 1970s for the Aspen Movie Map Project (Mohl, 1982).

The user's experience with Palenque is based on a self-directed exploration of an ancient Maya site, Palenque, and on the perusal of a multimedia database called the Palenque Museum. Users control a joystick to "walk" around the Palenque site, visit temples of interest, wander through the rain forest surrounding the site, see 360 degree panoramic views, or zoom in for close-up details of glyphs and stone carvings. Several characters from the *Mimi* television show can be selected at certain spots to find out more information about the various things discovered while exploring the Palenque site. In addition, an archeologist is available to give the user expert information about Palenque and about the ancient Maya, if desired. A camera can be selected at any time to "take pictures"

of things of interest. The pictures are automatically stored in a photograph album for later annotation and viewing. A dynamic you-are-here map can be called up for locational information, movement tracking, and "teleporting" quickly around the site.

The design research goal for the original Palenque prototype was to develop an engaging discovery-based experience for 8 to 14 year old children and their families to use at home that would pique their curiosity about a new content area and encourage them to explore an information space according to their own interests, in any sequence, and to any level of detail. Additionally, we wanted to develop an intuitive, colorful, highly visual interface that would make Palenque easy for children to use at home, independent of written manuals or other guidance. Toward this end, we attempted to interweave six components around a central theme (the ancient Maya) and place (Palenque). These components include: (1) video overviews to set the context and to introduce features, video characters, and content; (2) an Explore Mode, organized spatially, with surrogate travel experiences around the site at Palenque and access to related information; (3) a Museum Mode, organized thematically and hierarchically, with a multimedia database of four theme rooms: a Maya glyph room, a Palenque history room, a Palenque map room, and a rain forest room; (4) tools, such as a camera and album, a dynamic "you-are-here" map of the Palenque site, and a 360 degree pan feature; (5) games and activities, such as a treasure hunt game, glyph game, and rain forest symphony game that allow for image and sound manipulation; and (6) characters—including a boy the age of the target users, an archeologist, and a museum guide—that represent different points of view and serve as guides and information providers.

In the course of its development, the design of the Palenque prototype benefited greatly from an iterative process of formative research with child users. This process involved testing successive versions of the evolving prototype with children from our target audience of 8- to 14-year-olds. During these ongoing testing sessions, we observed children using the Palenque prototype and attempted to assess issues of appeal, comprehension, and interface usability. Changes were made in the design based on these observations, as well as on interviews with the children after each use (Wilson & Tally, 1990).

THE MUSEUM EDUCATION CONSORTIUM'S INTERACTIVE VIDEO PROJECT

The Museum Education Consortium is a collaborative effort among the education departments of seven art museums: The Art Institute of Chicago; the Museum of Fine Arts, Boston; The Brooklyn Museum; the Metropolitan Museum of Art; The Museum of Modern Art; The National Gallery of Art; and the Philadelphia Museum of Art. It was founded in 1987 to investigate the roles that technology might play in museum and art education in efforts to provide more effective access to the arts. Several research and development prototypes have been developed over the past five years as part of this research and development effort. This paper briefly describes the design and development of one of these prototypes, called "The Museum Visitor's Prototype" (1988-1991), which was created as part of the larger research effort to explore new methods for introducing visitors to different ways of looking at and thinking about paintings. The work of the consortium has been funded by The Pew Charitable Trusts, the J. Paul Getty Trust Grant Program, and the Andy Warhol Foundation for the Visual Arts.

The Museum Visitor's Prototype is an interactive multimedia prototype that was developed as a discovery-based learning experience for testing with adult museum visitors who have limited knowledge of art history or art. It was designed to be used in an art museum setting by one person alone or by small groups of visitors for five to fifteen minutes. The goals of the prototype were several: (1) to introduce users to new tools for learning to look at and reflect on works of art using the features of interactive video technology to facilitate this process and to enjoy the experience of looking at art; (2) to pique curiosity and foster self-directed exploration in an engaging way so that the experience of using the interactive prototype would be enjoyable as well as informative, and would be based on each user's individual interests and evolving knowledge base; and (3) to offer easy access to a rich multimedia information base of images, films, narration, and text so that users would come away with an increased understanding of selected Impressionist and Post-Impressionist artists and their work (Wilson, 1991).

Although the final product will most likely explore several artists, their work, and their life and times, the prototype focuses, for the sake of example, on one artist and, in fact, on one painting: Claude Monet and his "Waterlilies" painting (1926), which is currently at the Museum of Modern Art in New York City. The discovery-based design of the prototype allows for access to information about a variety of paintings, sketches, details, artists, and documentary images and films, particularly as they relate to Monet and his work. The three frameworks for exploration in the prototype include:

1. **Paintings**: looking at the painting, "Waterlilies," itself. In this framework users can look more closely at selected paintings and explore a variety of formal features, by zooming to close-up details, hearing audio commentary about the paintings, seeing comparisons to other works, etc.

2. **Artists**: finding out about the artist, Claude Monet, through his studio. In this framework, users can learn more about the artist's life, technique, thoughts, collections of paintings, etc.

3. **Context**: finding out about relevant historical contexts, such as Monet's life in his garden at Giverny, that reveal something about the life and times of the artist.

A video overview introduces the prototype's contents and how to use its interactive features. Audio commentary, often accompanied by "talking heads" video, is available from several different characters, including a museum educator, a museum visitor, a cultural historian, and an art student. Various interactive features include visual zooms to details of paintings, a timeline of cross-referenced historical and contextual information, an introductory-level dictionary of terms, open-ended questions for directed looking, and side-by-side comparisons of paintings or between paintings and controllable film clips depicting the location painted. Access to information is made available via selectable "hot" sections of visual menus, such as canvasses and journals depicted graphically in an image of Monet's studio, and through the selection of pictographic icons at the top and bottom of the screen.

Since the project was a research and development effort, the consortium decided to experiment with the creation of a design research prototype that included a potpourri of design ideas and features which could be tested with visitors for their effectiveness. As such, the prototype is somewhat unusual in that it attempts to explore the possibilities of a discovery-based design for adults and has a variety of features and options for testing, rather than a single, consistent interactive blueprint for a final product. The prototype runs on a hardware platform that includes a Macintosh II computer with Truevision's Nuvista image capture and overlay board, a Pioneer 4200 videodisk player, an Electrohome color monitor, and stereo speakers. In an effort to test reactions to the image quality of images stored in different formats, images in the prototype are displayed in both analog form from a videodisk and digital form from the computer's hard disk. Some of the motion footage was filmed in HDTV, as a part of the image quality testing, then downconverted and stored on the videodisk. The input device is a mouse.

In 1990-1991 we conducted a number of formative research sessions at the Museum of Modern Art and the Brooklyn Museum observing visitors using the Museum Visitor's Prototype. These sessions provided useful feedback about the effectiveness of the prototype's various design features to meet its goals with its intended audience. Through this process, the concepts of the design and production team as implemented in the preliminary prototype were confirmed or disconfirmed and suggestions for revisions were generated (Wilson & Richner, 1991).

DESIGN FEATURES COMMON TO PALENQUE AND THE MUSEUM VISITOR'S PROTOTYPE

Palenque and the Museum Visitor's Prototype share several design features that seem to foster the discovery-based approach. Among these are the creation of exploratory experiences in multidimensional environments and the accompanying user interface conventions. Although these two aspects are interwoven in these applications, they are separated here for the sake of discussion.

Multidimensional, yet bounded, environments

These simulated environments are designed to be experienced as small, controllable worlds to be explored, manipulated, reflected on, and enjoyed. Their structure is implicit rather than explicit. They have bounds on them in terms of content—for example,

the use in Palenque of one ancient Maya site rather than an encyclopedic Maya or ancient history database—which helps to give them a sense of coherence and implicit structure.

In the best of cases, users navigate easily within these environments and have a sense of the kinds of things they'll find there, but not necessarily the specifics of what they'll find along the way. Some design characteristics these environments share are: (1) a core database of images, sounds, text, narration, film clips, and graphics that can be accessed in multiple and flexible ways; (2) movement (a sense of control over fluid movement through and being in the environment, visual as well as intellectual movement through information, the ability to browse); (3) access to multiple perspectives and points of view, as well as to multiple media formats; (4) discovery (surprise, diversity, multiple levels of penetration through information); (5) activities (manipulation of information, images, sounds; puzzles, games, questions) (6) aesthetic appeal (visual, auditory, emotional, and intellectual appeal, for example, through images of and experiences with architecture and art, which are designed to lead to a sense of pleasure, fun, and accomplishment; high realism via high resolution images, sounds, graphics); (7) personalization (the ability to reflect on or to transform information, and to reconstruct it or make it meaningful in one's own way); and (8) narrative elements as organizers (such as the use of video characters, and specific themes and places).

The user interface

In both prototypes, various interface conventions have been used to promote information access and manipulation. Both were designed to be as intuitively easy to use as possible. Ideally, the interface becomes transparent to users, allowing them to focus on their investigations of the content. Functional and organizational metaphors, such as allusions to taking a trip in Palenque or visiting Monet's studio and garden at Giverny, were used from time to time to facilitate navigation. Interface conventions that are consistent in availability and function, such as the use of menu bars and icon panels, have been used to help users establish a sense of knowing what to do, how to do it, and where they are while exploring these novel environments. Some of these interface features include: (1) contextualizing (through the use of video overviews and audio commentary); (2) multiplicity of options (through a variety of menu bar and icon panel selections available on the screen); (3) visual and spatial access to and organization of information (through the use of pictures as menus, places as organizational structures, pictographic icons as buttons and landmarks, maps, timelines); (4) locational information (through highlights, arrows, maps, signs, labels, "your location" windows); 5. reversibility (the ability to "go back" at any point, to do something, then undo it, to interrupt things, to get to the main menu directly, to exit quickly); and (6) direct, quick feedback (quick system reactions and system acknowledgment that a user input has been made).

SUMMARY

As with any creative process, the design and development of interactive multimedia applications involve numerous decisions that must be made along the way which ultimately affect the final product. These decisions range from highly philosophical to highly practical, and are not always easily made by a development team comprised of people with diverse backgrounds and talents. In the process of developing the two design research prototypes described in this paper, for example, we struggled with a number of design issues, including the definition of learning goals; pedagogical style; target audiences; target context; anticipated interaction time; relevance to and integration with current practice; content research and development (who will do it and who will have editorial control); how much material will need to be acquired (and what the copyright issues are) and how much will be produced originally; optimal user interface design features; appropriate hardware and software to use (concerns for high resolution images and sounds and the need for complex, quick interactivity); and evaluation concerns (how to evaluate the effectiveness of the emerging design to meet our goals with our target audience). It is our hope that consideration of and experimentation with these issues, and many more that emerge with each new project, will ultimately lead to the creation of more appealing, usable, effective, and diverse multimedia products to complement current products and practices, and to better meet the needs of a variety of users in a variety of contexts in the future. ■

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